

22. If $x = -101$ , then all 101 terms in the product are negative. A) -98      B) -99      C) -100      D) -101	22. D
23. Expand $(x+1)^n$ for $n = 1,2,3,\dots$ . The coefficient of $x^1$ is always $n$ . A) 400      B) 20      C) 19      D) 1	23. B
24. If $x = 0$ , then $\frac{1}{x}$ is undefined; if $x = \pm 1$ , then $x - \frac{1}{x}$ is undefined. A) 1      B) 2      C) 3      D) 4	24. C
25. $x^2+4x+4 = (x+2)^2 = (y+4)^2 = y^2+8y+16$ . A) $y^2+16$ B) $y^2+8y+16$ C) $y^2+4y+20$ D) $y^2+4y+6$	25. B
26. $\sqrt{b(a+1)^3} = \sqrt{b(a+1)} \times \sqrt{(a+1)^2} = \sqrt{ab+b} \times  a+1 $ is an integer. A) $\sqrt{b(a+1)^0}$ B) $\sqrt{b(a+1)^2}$ C) $\sqrt{b(a+1)^3}$ D) $\sqrt{b(a+1)^4}$	26. C
27. Line $\ell$ is perpendicular to line $k$ . If the slope of $\ell$ is $-2$ , then the slope of $\ell$ divided by the slope of $k$ equals $-2 \div (1/2) = -4$ . A) $\frac{1}{4}$ B) $-\frac{1}{4}$ C) 4      D) -4	27. D
28. To make square as large as possible, use mostly 9s. For an even product, still a square, use two 8s. Then, $9+9+9+9+9+8+8 = 61$ . A) 28      B) 58      C) 61      D) 63	28. C
29. If $A/P$ is an integer, then $s^2/(4s) = s/4$ is an integer. Thus, $s$ must be divisible by 4. Only choice A is divisible by 4. A) 456      B) 567 C) 678      D) 789	29. A
30. In order, the terms of the sequence are $k, 1/k, k, 1/k, \dots, k, 1/k$ . The sum of all $2n$ terms is $(n \times k) + (n \times 1/k) = nk + (n/k) = (nk^2+n)/k$ . A) $\frac{nk^2+n}{k}$ B) $\frac{nk^2+n}{2k}$ C) $\frac{k^2+1}{kn}$ D) $\frac{n+k}{k^2}$	30. A



The end of the contest **A**

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## Information & Solutions

Spring, 2004

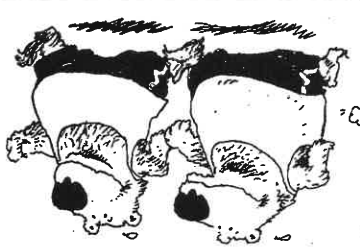
### Contest Information

# A

- Solutions** Turn the page for detailed contest solutions (written in the question boxes) and letter answers (written in the *Answers* column to the right of each question).
- Scores** Please remember that *this is a contest, not a test*—and there is no “passing” or “failing” score. Few students score as high as 24 points (80% correct). Students with half that, 12 points, *deserve commendation!*
- Answers & Rating Scale** Turn to page 150 for the letter answers to each question and the rating scale for this contest.



1.  $(2^2)(2^0)(2^0)(2^4) = (2^2)(1)(1)(2^4) = (2^2)(2^4) = 2^6$   
 A) 0 B)  $2^6$  C)  $2^8$  D)  $2^{2004}$



2. Hairy took  $x$  minutes. Bary took 1 minute longer =  $x+1$ . Finally, the product of these two times is  $x(x+1) = x^2+x$ .  
 A)  $2x^2+1$  B)  $2x+1$  C)  $x^2+1$  D)  $x^2+x$

3. Since  $-100 - (-10) = -100 + 10$ , the answer is B.  
 A) -110 B) -100 C) -90 D) 100

4. Order of operations:  $(100 \div 10) \times 10 + (10 \times 10) = 100 + 100 = 200$ .  
 A) 101 B) 110 C) 200 D) 1100

5.  $(-1)^2 + (-1)^0 + (-1)^1 = 1 + 1 + (-1) = 1$ . A) 2 B) 4 C) 6 D) 8

6. The only positive divisors of  $p^2$  are 1,  $p$ , and  $p^2$ .  
 A) 1 B) 2 C) 3 D) 4

7.  $(a+b)^2 = a^2 + b^2 + 2ab$ , so  $(234^2 + 567^2) = 234^2 + 567^2 + 2 \times 234 \times 567$ .  
 A) 0 B)  $234 + 567$  C)  $234 \times 567$  D)  $468 \times 567$

8.  $\frac{x^2+1}{x^2} = \frac{x^2}{x^2} + \frac{1}{x^2} = 1 + \frac{1}{x^2}$ . A)  $1 + \frac{1}{x^2}$  B)  $1 + x^2$  C)  $x^2 + \frac{1}{x^2}$  D)  $\frac{1}{x^2}$

9. A DVD cost 1.5 times as much as a CD, so (cost of 12 DVDs): (cost of 15 CDs) =  $12(1.5x):15(1x) = 18:15 = 6:5$ .  
 A) 4:5 B) 5:4 C) 5:6 D) 6:5

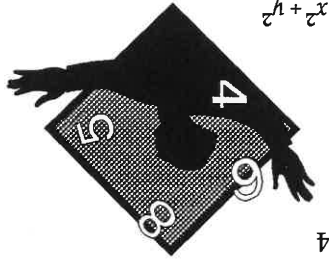
10. Mary resisted dunking her doughnut for  $\frac{b}{a}$  of a minutes. Mary resisted dunking her doughnut for  $(\frac{b}{100}) \times a = \frac{ab}{100}$  minutes.  
 A)  $ab$  B)  $\frac{10}{ab}$  C)  $\frac{100}{ab}$  D)  $\frac{1000}{ab}$

11.  $\sqrt{2^2} + \sqrt{2^4} + \sqrt{2^6} = 2^1 + 2^2 + 2^3 = 2 + 4 + 8$ .  
 A)  $2+4+8$  B)  $2 \times 4 \times 8$  C)  $2+4+6$  D)  $2 \times 4 \times 6$

Go on to the next page

12. Since  $(x+3)(x-3) = x^2-9$ , it follows that  $a = -9$ .  
 A) -9 B) -3 C) 3 D) 9

13. If  $x^2 = 5$ , then  $(x+1)(x-1) = x^2-1 = 5-1 = 4$ .  
 A) -24 B) 24 C) -4 D) 4



14.  $x[x(x+2)+2]+2 = x(x^2+2x+2) = x^3+2x^2+2x+2$   
 $[2]+2 = x(x^3+2x^2+2x+2)+2 = x^4+2x^3+2x^2+2x+2$   
 A) 4 B) 5 C) 6 D) 8

15.  $\frac{1}{x^2} + \frac{1}{y^2} = \frac{y^2}{x^2 y^2} + \frac{x^2}{x^2 y^2} = \frac{y^2+x^2}{x^2 y^2}$   
 A) 1 B) 2 C)  $\frac{x^2 y^2}{x^2+y^2}$  D)  $x^2+y^2$

16. The area of  $S$  is  $x^2$ . The perimeter of  $S$  is  $4x$ . The sum of the area and the perimeter of the square is  $x^2+4x = x(x+4)$ .  
 A)  $x(x+4)$  B)  $(x+2)(x+2)$  C)  $(x+4)^2$  D)  $4x^3$

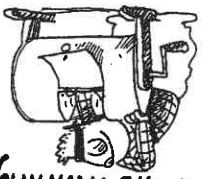
17.  $(x-9)^2 = 1 \Leftrightarrow x = 10$  or  $8$ . The difference =  $10 - 8 = 2$ .  
 A) 0 B) 2 C) 9 D) 18

18.  $(x+3)^2 = (x+3)(x+3) = x^2+6x+9$ , so  $x^2+6x+9$  is a square.  
 A)  $x^2+x+9$  B)  $x^2+4x+9$  C)  $x^2+6x+9$  D)  $x^2+9x+9$

19. The point  $(100, -100)$  is 100 units right of the  $y$ -axis and 100 units below the  $x$ -axis, so it's 100 units from both axes.  
 A)  $(100, -100)$  B)  $(0, 100)$  C)  $(-100, 0)$  D)  $(0, -100)$

20. The integers  $\pm 1, \pm 2, \pm 3, \pm 4$  satisfy  $(x^2-1)(x^2-4)(x^2-9)(x^2-16) = 0$ .  
 A) 0 B) 4 C) 8 D) 16

21. The roots of  $x^2+bx+c = 0$  are 4 and 5, so  $(x-4)(x-5) = x^2-9x+20 = 0$ . Thus,  $b = -9$  and  $c = 20$ . The winning number is  $-9+20 = 11$ .  
 A) 9 B) 11 C) 19 D) 21



And the winning number.

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